CLAIMS

1. A medical tubing adapted for insertion into a body tissue or cavity having a length with variable characteristics, comprising:

a plurality of individual, discrete, generally ring-shaped elements arranged in series and fused or bonded together forming a continuous tubular structure.

2. The medical tubing of claim 1, wherein the ring-shaped elements are formed of a thermoplastic material.

3. The medical tubing of claim 1, wherein the ring-shaped elements are formed of a thermoset material.

4. The medical tubing of claim 1, wherein the ring-shaped elements include at least one of plastic rings, metallic rings, un-reinforced plastic rings and metal reinforced plastic rings assembled along the length of the tubular structure to provide variable flexibility and kink-resistance.

5. The medical tubing of claim 1, wherein the tubular structure may be bent, twisted or curved without kinking.

6. The medical tubing of claim 1, wherein the tubular structure has a cross-structure including circular, oval, rectangular, triangular, hexagonal and any geometric shape.

7. The medical tubing of claim 1, wherein the ring-shaped elements have different flexural modulus.

8. The medical tubing of claim 1, wherein the ring-shaped elements include a combination of flexible and rigid ring-shaped elements assembled along different portions or sections of the tubular structure.

9. The medical tubing of claim 4, wherein the metallic rings are coated with plastic and are assembled with alternating elastomeric rings.

10. The medical tubing of claim 8, wherein as the tubular structure is bent, twisted or curved, the rigid ring-shaped elements provide reinforcement to maintain the size and shape of the lumen and the flexible ring-shaped elements operate to stretch and compress to prevent kinking.

11. The medical tubing of claim 1, wherein the ring-shaped elements are metallic and are bonded with a resilient, flexible elastomeric adhesive.

12. The medical tubing of claim 11, wherein the ring-shaped elements have different lengths and are fused closer or further apart to one another depending on the characteristics of a portion or section of the tubing.

13. The medical tubing of claim 1, further comprising a secondary lumen and a pull wire to control the tubular structure.

14. The medical tubing of claim 1, wherein at least one of the ring-shaped elements is truncated to provide a bending bias.

15. The medical tubing of claim 14, wherein the truncated elements comprise of alternating flexible ring-shaped elements and rigid ring-shaped elements.

16. The medical tubing of claim 1, wherein the ring-shaped elements vary in diameter in different portions or sections of the tubular structure.

17. The medical tubing of claim 16, wherein the composition of the ring-shaped elements vary in the different portions or sections of the tubular structure.

18. The medical tubing of claim 17, wherein the ring-shaped elements are assembled in accordance with a preferred modulus within portions or sections of the tubular structure.

19. The medical tubing of claim 1, wherein at least one of the ring-shaped elements is radiopaque.

20. The medical tubing of claim 1, wherein the ring-shaped elements comprise of different colors to operate as indicators along the tubular structure

21. A method of manufacturing a medical tubing having a length with variable characteristics, the medical tubing comprising a plurality of individual, discrete, generally ring-shaped elements arranged in series and fused together to form a continuous tubular structure, the method comprising the steps of:

placing the plurality of ring-shaped elements upon a support member or mandrel in a series arrangement; and

heating the plurality of ring-shaped elements to fuse them together over the support member or mandrel

22. The method of claim 21, further comprising placing the plurality of ring-shaped elements upon a second support member or mandrel before the heating step to subsequently form a second lumen or control tube to the tubular structure.

23. The method of claim 21, further comprising forming a control tube over the assembled ring-shaped elements prior to the heating step.

24. The method of claim 23, wherein the control tube comprises at least one of glass, silicone, heat shrinkable polyolefin, PTFE, FEP, metallic or other tubing that has a higher melting temperature than the assembled ring-shaped elements.

25. A method of manufacturing a medical tubing having a length with variable characteristics, the medical tubing comprising a plurality of individual, discrete, generally ring-shaped elements arranged in series and fused together to form a continuous tubular structure, the method comprising the steps of:

placing the plurality of ring-shaped elements upon a support member or mandrel in a series arrangement; and

fusing the plurality of ring-shaped elements together over the support member or mandrel with a solvent or other chemical compound.

26. The method of claim 25, wherein the fusing step further comprises immersing the ring-shaped elements into the solvent to fuse the elements

27. A method of manufacturing a medical tubing having a length with variable characteristics, the medical tubing comprising a plurality of individual, discrete, generally ring-shaped elements arranged in series and bonded together to form a continuous tubular structure, the method comprising the steps of:

placing the plurality of ring-shaped elements upon a support member or mandrel in a series arrangement; and

bonding together the plurality of ring-shaped elements upon a support member or mandrel with an adhesive.

28. The method of claim 27, wherein the adhesive is photodynamic or heat-activated.

29. The method of claim 21, further comprising coating the tubular structure with an elastomeric adhesive or dispersion.

30. The method of claim 21, wherein the mandrel has a pre-formed curvature for accessing a specific region of a body cavity.

31. The method of claim 21, wherein the mandrel includes a collapsible, inflatable or dissolvable mandrel allowing the tubular structure to vary in diameter and lumen size.

32. The method of claim 31, wherein the mandrel is formed of an electrically dissolvable epoxy resin.

33. The medical tubing of claim 1, wherein the tubing is used as an AV introducer, a urological sheath, a ureteral access sheath, a urethral and bladder access sheath, a kidney access sheath, a ureteral stent, a trocar cannula, a suction/irrigation tubing, an insufflation tubing, a vacuum tubing, a split sheath introducer, a

tracheostomy tube, an intubation tube, a gastronomy tube, a jujenostomy tube, an extracorporeal retrograde cholangeopancreatography catheter, an endoscope shaft, a drainage tube, a guide catheter, a hydrocephalic shunt, a guidewire, an angioplasty and dilation balloon, a vascular graft, a cholangiography catheter, a vascular embolectomy/thrombectomy catheter, or a central venous catheter.

34. A method of manufacturing a thin-walled tube, comprising:

coating a wire with a plastic material;

wrapping the coated wire around a mandrel forming a plurality of windings; and

heating the wound coated wire until the plastic material melts and bonds the windings forming a wire-reinforced tube.

35. The method of claim 34, wherein the plastic material comprises at least one of polyurethane, a thermoplastic material and a thermoset material.

36. The method recited of claim 34, wherein the wire comprises at least one of a metallic material and a second plastic material.

37. The method of claim 34, wherein the wire is coated with the plastic material in a coextrusion process.

38. The method of claim 34, wherein the tube has a wall thickness of about 0.015" or less.

39. The method of claim 34, wherein the tube has an inner diameter that ranges from about 0.026" to about 0.75".

40. The method of claim 39, wherein the tolerance on the inner diameter is on the order of 0.001" or less.

41. The method of claim 34, further comprising compressing the windings as the coated wire is being heated

42. The method of claim 34, further comprising providing a mold to compress the windings.

43. The method of claim 34, further comprising removing the wire-reinforced tube from the mandrel after the tube is cooled.

44. The method of claim 34, wherein the wound coated tube is heated until the plastic material is formed above, below and between all the windings.

45. The method of claim 34, further comprising dipping the tube in a solvent based solution forming an outer layer of the tube.

46. The method of claim 34, wherein the mandrel is tapered to provide the tube with varying diameter throughout the length of the tube.

47. The method of claim 34, further comprising providing a filament comprising a material different from the coating of the wire.

48. The method of claim 47, wherein the coated wire is alternatively wound with the filament around the mandrel.

49. The method of claim 34, wherein the mandrel may be any shape such that the resultant shape of the tube can be removed from the mandrel after the heating step.

50. The method of claim 49, wherein the mandrel is a multiple-part mandrel.

51. A method of manufacturing a kink-resistant thin-walled tube having a length with different characteristics, comprising:

coating a mandrel with a first layer of plastic material;

placing a spring reinforcement over the first layer; and

coating the spring reinforcement with a second layer of plastic material to form a spring-reinforced tube.

52. The method of claim 51, wherein the first layer is formed in an extrusion process.

53. The method of claim 51, wherein the first layer is formed in a molding process.

54. The method of claim 51, wherein the second layer is formed in an extrusion process.

55. The method of claim 51, wherein the second layer is formed in a molding process.

56. The method of claim 51, wherein the spring reinforcement is a pre-wound wire comprising at least one of a metallic material and a second plastic material.

57. The method of claim 51, wherein the spring reinforcement is a wire comprising at least one of a metallic material and a second plastic material wound around the first layer.

58. The method of claim 51, further comprising dipping the tube in a solvent based solution forming an outer layer of the tube.

59. The method of claim 51, wherein the mandrel is tapered to provide the tube with varying diameter throughout the length of the tube.

60. The method of claim 51, wherein the mandrel may be any shape such that the resultant shape of the tube can be removed from the mandrel.

61. The method of claim 60, wherein the mandrel is a multiple-part mandrel.

62. A method of manufacturing a kink-resistant thin-walled tube having a length with different characteristics, comprising:

coating a mandrel with a first layer of plastic material;

placing a spring reinforcement over the first layer; and

dipping the spring-reinforced first layer in a solvent based solution to form a second layer of the tube.

63. The method of claim 62, wherein the second layer is impervious.

64. The method of claim 62, wherein the mandrel is tapered to provide the tube with varying diameter throughout the length of the tube.

65. The method of claim 62, wherein the mandrel may be any shape such that the resultant shape of the tube can be removed from the mandrel.

66. The method of claim 65, wherein the mandrel is a multiple-part mandrel.